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ABSTRACT

Issues are discussed that may help school boards become more aware of what instructional technology can and should do for students. The discussion is limited to computers and their relationship to other electronic learning technologies. The issues are organized according to policy and planning, staff, curriculum, equity, and funding. The effectiveness of computers in the schools can be realized only when there is adequate planning for their use, adequate training of the teachers and other staff who will use them, and high quality software. Equity issues include individual student access within a school building, access within the school district, the availability of equipment for both high-wealth and low-wealth districts, minority access, and male/female access. Cost is one of the most important reasons school districts must carefully plan acquisition of educational technology. A summary of recommendations is given at the front of the booklet, while two appendixes provide a sample instructional technology policy statement and a list of "19 Tough Questions to Ask and Answer" in evaluating the effectiveness of computer use in the classroom. (28 references) (SI)

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Instructional Technology

Policies and Plans

A Position Paper of the
NEW YORK STATE
SCHOOL BOARDS ASSOCIATION

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Table of Contents

Summary of Recommendations v

Introduction 1

Policy and Planning 3

- Administrative Uses 4
- Planning and Assistance 5

Staff 7

Curriculum 8

Equity 11

Funding 12

Conclusion 14

Appendix A 15

Appendix B 17

Notes 19

Bibliography 21

Summary of Recommendations

1. School boards should develop policies that commit their districts to the goal of ensuring students' technology literacy while making the most effective use of local resources.
2. Successful computer integration depends on laying the groundwork: a school district should have definite goals which define what it expects technology to do in terms of instructional and/or administrative purposes.
3. A technology planning committee should be an integral part of planning.
4. Ideally, administrative and instructional uses of computers and technology should be compatible and equitable.
5. New York State should give more attention to helping local school districts plan technology implementation. High priority should be given to coordinating state and regional initiatives, and to more opportunities for teachers to learn how to use computers effectively in teaching specific academic and vocational subjects.
6. Teacher-related issues concerning computers and other forms of technology should not become mandatory subjects of collective bargaining.
7. Teachers should be inspired instead of required to learn about and apply technology.
8. The growth of relatively sophisticated applications of computers and technology in education should prompt districts to reexamine their curriculum to make it compatible with the technology they plan to acquire.
9. As school boards develop and assess their technology plans, they should seek ways to demonstrate a commitment to providing equal access to all students.
10. State aid for computer software and hardware should be combined to give local school districts more flexibility in utilizing funds.

Introduction

The computer revolution has invaded schools forcefully. Between 1981 and 1987, the percentage of American schools with at least one computer for instructional use increased from 18 to 95 percent.[1] Within New York State public schools, the ratio of students to one computer decreased from 46 in 1984-85 to 24 in 1986-87, and the average number of microcomputers per school doubled, from 14 to 28.[2]

Yet a study by the National Assessment of Educational Progress (NAEP), conducted in the 1985-86 school year, showed that while most students had some familiarity with computers—for example, could identify a keyboard, disk drive, and printer—few were able to answer questions about the most important applications of computers, including programming.

In terms of actual computer use, 9 of 10 students had used a computer by the 11th grade, but only a small fraction had gained such experiences in learning traditional subjects such as math and reading. Instead, playing games with computers, either inside or outside of school, and courses specifically in computers, seemed to be the main methods of learning.[3]

Much like the pencil, textbook, blackboard, and other forms of technology which preceded it, the computer has the capacity to revolutionize how and what schools teach the children. However, its potential effectiveness can be realized only when there is adequate planning for its use and adequate training of teachers and other staff who will use them. Technology cannot be treated simply as an add-on to the established curriculum and instructional process. The computer is not a magic box that will teach; it is a means to an end rather than the end itself.[4]

What effect has the computer had on education? What is its potential? In addressing these and other related questions, this position paper discusses issues that may help school boards become more aware of what computers can and should do for students.

First, a word about definitions. It is easy to interchange the terms computer and technology. They are not the same. If technology is defined as a scientific means for achieving a practical purpose,[5] then the computer is but one means for achieving that purpose, in this instance, instruction.

Other instructional technologies may include the pencil, textbook, and blackboard, as previously mentioned, as well as electronic learning technologies such as computers (stand-alones and networks), telecommunications, distance learning, interactive video technology, video disks, laser disks, and robotics.

This discussion will be limited to computers, and their relationship to other electronic learning technologies. The issues include and are organized according to policy and planning, staff, curriculum, equity, and funding.

Computers have a major impact on subjects and how they are taught. Appropriate technologies can improve:

- effective higher order thinking instruction,
- coaching and tutoring,
- access and ability to manipulate information through computerized data bases and interactive communication,
- drill and practice with corrective feedback,
- data regarding school conditions and performance,
- productivity through practical experiments with new school structure and staffing strategies.

Computers and technology also have the potential to change content and style of teaching, as well as relationships between teachers and their students, among colleagues, and between the school and the community.

New electronic learning technologies will not necessarily improve American education. The textbook, audiovisual technology, and television have not—by themselves—revolutionized instruction.

It still requires the teacher and other instructional personnel to guide students through the educational process.

It still means that humans must feel comfortable and competent in manipulating machinery to achieve educational goals. Human interaction is an important dimension of most learning. Computers, nonetheless, if used properly, have the potential to make learning easier and more rewarding for both teachers and students.

Policy and Planning

The effectiveness of computers in the schools can be realized only when there is adequate planning for their use, adequate training of the teachers and other staff who will use them, and high quality software.[6] It is up to local school boards to develop policies that commit districts to the goal of ensuring students' technology literacy while making the most effective use of local resources.

Such policies should cover the following features (see sample policy in Appendix A):

- a definition of technology (computers) as it applies to the school district;
- a statement of the relationship of computer literacy to existing curriculum;
- general student goals;
- how the district plans to deal with issues such as equity, staff deployment and development, curriculum and program priorities, and resource allocations;
- creation and definition of the position of computer coordinator;
- creation of a computer/technology planning committee to advise the school board in the acquisition and use of the technologies.

A technology planning committee should be an integral part of planning. It may include representatives of any group involved in use of the technology—school board members, administrators, teachers, support staff, parents, students, and computer coordinators.

Why should districts consider hiring or designating a computer coordinator? Many districts spend between one and two percent of their budgets for computer hardware, software, related curriculum planning and revision, staff in-service, and the like. Few can afford to experiment or make big mistakes in acquiring the technology.[7] Whether a school district hires someone specifically for the job or designates a staff member either already interested in computers or willing to learn and take the responsibility is less important than that person's becoming the conduit for computer technology information within the district. The coordinator facilitates good computer use, increases communication between users, troubleshoots, and generally makes sure that the system runs effectively and is used widely.

The coordinator's value is well recognized already. Among 908 New York State public school principals surveyed in a 1988 study conducted for Apple Computer, Inc., entitled the "North East Education Data Report,"* 72 percent indicated they have a building computer resource

* This unpublished survey, completed for Apple Computer, Inc., asked building principals in 10 northeastern states (Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont) to provide information on computer planning, acquisition, and usage for instructional purposes. New York State data was provided by James G. Lengel, education technology consultant, Apple Computer, Inc.

person, and 67 percent indicated that this position was held by teachers with regular teaching duties.

Without adequate planning, school districts risk haphazard purchasing practices, inequitable equipment distribution, incompatible or unsuitable software acquisition, skyrocketing costs, equipment obsolescence, and indiscriminate networking of computer links within a district and between districts. Yet fewer than one-third of districts in New York State reported having a computer/technology committee.[8]

One illustrative New York school district that planned well for computer integration began with its board's adoption of goals in this area. The district then formed separate planning groups for instructional and administrative computer uses.

The instructional group, chaired by the instructional computer coordinator, has developed a five-year plan; the administrative group, chaired by the director of management information services, has developed a three-year plan. Each group is composed of teachers and administrators. This district, which has had its own computer operation since the early 1980s, constantly reevaluates its operation to update and change it to make it more efficient.

Most school districts are beyond the initial acquisition of computer hardware and software; they must work within the parameters of what they already have. A technology committee's first task should be to inventory existing equipment and staff capabilities to determine compatibility with district's goals. Even more important, the technology committee's primary function should be to serve as a source of advice and factual information to the school board, which must ultimately decide how best to utilize educational and financial resources.

Administrative Uses

Though administrative uses of the computer may be just as important to the effective operation of a school district as instructional uses, the issue sometimes becomes whether one should take precedence over the other, especially when funds are limited.

There is no question that school districts have embraced the administrative use of computers. In fact, a study by the New York State Legislative Commission on Expenditure Review found that three in 10 districts surveyed have used state *instructional* computer aided hardware for *noninstructional* purposes.[9]

A 1987 survey by the New York State Association of School Business Officials found that 95 percent of those members surveyed used a computer for administrative tasks[10] such as word processing, budget preparation, and payroll. Such use is also proving to be cost-effective in terms of record management. But while computers have greatly enhanced districts' abilities to accomplish such administrative func-

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tions, the time has come to focus resources on the computer's instructional capabilities.

Ideally, administrative and instructional uses should be compatible and equitable. Ultimately, the individual school district must decide how best to prioritize and deploy its technology resources.

Planning Assistance

School districts that seek technical assistance from the New York State Education Department will find it mainly under the umbrella of Technology Network Ties (TNT). TNT is developing into a statewide electronic infrastructure to connect school districts, boards of cooperative educational services (BOCES), libraries, and the State Education Department in a single network to accommodate primarily administrative and, secondarily, instructional purposes. TNT is dedicated to the following:

- *Comprehensive Instructional Management System (CIMS)* is a total approach to curriculum development, teaching, testing, and computer-managed instruction that addresses effective school factors. CIMS uses computer technology to provide timely analysis of pupil test results to teachers and long-term analysis of overall education program results to administrators. The State School Boards Association continues to advocate that CIMS receive funding from the State Legislature.

- *Student Information System (SIS)* has the capacity to track and identify at-risk students. It also supports administrative, management, and record keeping requirements for large urban districts and those schools served by BOCES Regional Information Centers. SIS keeps the following kinds of information on students: biographical, attendance, academic, course scheduling, program participation, instructional management, and health/medical information.
- *Model Schools Program,* a cooperative venture between the State Education Department, the New York State Legislature, and 17 school districts in Herkimer, Lewis, Madison, and Oneida counties, is doing research to evaluate the extent to which computer technology can improve and enhance instruction in elementary and secondary schools. Activities have included the development and field testing of technology-based extensions of CIMS math and science lessons in order to provide alternative learning experiences for special education and at-risk students.

Other sources include teacher resource and computer training centers, BOCES, regional computer training centers, and professional organizations such as the New York State Association for Computers & Technologies in Education (NYSAC&TE). Computer coordinators often feel that the best help comes directly from other school districts that have had similar experiences. Because so little evaluative information is available on the state's teacher resource and computer training centers, and the regional computer training centers, these two sources of assistance should be tested carefully by individual districts for their effectiveness.

The State Education Department has provided only limited guidance to school districts in planning the implementation of instructional technology. Although a document entitled *Learning Technologies Planning Guide* was published by the State Education Department in 1985, most direct technical assistance from the state level has been available only through the department's Center for Learning Technologies. It has charged substantial user fees, a requirement of the State Division of the Budget that discourages individual educators in need of help. A reorganization of state level services is underway.

The state should give more attention to helping local school districts plan technology implementation. High priority also should be given to coordinating state and regional initiatives, and to more opportunities for teachers to learn how to use computers effectively in teaching specific academic and vocational subjects.

Staff

Computers potentially can change the role of the teacher from that of the information source and delivery device, to the role of a facilitator or learning coach. Thus, teachers may concentrate more on helping students acquire "people skills" and higher order thinking skills.[11]

A critical issue is whether, or to what extent, teachers and other instructional personnel accept technology and incorporate it into their teaching strategies. The more teachers are involved in the initial planning stages, the more likely they will actually use computers in their classrooms.

Teachers seem more willing to use the technology if they are given the opportunity to learn to use it—through in-service via teacher resource and computer centers, BOCES, special workshops, and/or in-house lessons by a school computer coordinator. Some districts allow teachers to take home computer hardware where they can learn by experimenting to use the equipment. The North East Education Data survey reported that more than 97 percent of teachers in New York State schools surveyed use computers, though less than two-thirds use computers *often*. In contrast, 92 percent of the schools' students indicated they use computers often.

Teacher unions see several computer technology-related issues as subjects for collective bargaining, specifically in connection with representation of teachers on computer planning committees, and in applying distance learning. School boards should maintain that these matters are best determined locally and that they should not become mandatory subjects of collective bargaining.

As with any new technology or teaching tool, there is bound to be some resistance. One of the teachers' concerns is job security. Distance learning illustrates the point. It links schools together through telecommunications and computers to allow schools to interact and to offer an expanded number of courses not normally offered because of limited resources and declining enrollments. Some teachers feel their jobs are threatened by this technology because fewer of them may be needed, and their job tasks may be performed by assistants. Implementation has proven otherwise, however.

For example, in a networked, three-school cluster, one offers an advanced placement course in mathematics that requires one person to teach the course from one school, but the other two schools may need teachers in the classroom to facilitate test-taking or to teach other courses, or to assist other students individually. More generally, machines are no substitute for teachers, even though technology often creates new opportunities for learning.

Another issue is whether school boards should primarily hire teachers who are already computer literate. Yes, but within reason. Often, new teachers are ill-prepared either to use or integrate technology into preparing curricular materials, lesson plans, and assessments. Teacher education programs should include coursework on integrating technology with teaching methods and curriculum.

Some of the best instructional uses of computers are invented by teachers who learn to use the equipment and then experiment, finding what works best for them. If prospective teachers learn enough about computer applications to envision practical and immediate uses once on the job, ultimately students will become the beneficiaries. Boards may not find it feasible to require computer literacy of all future teacher employees, but clearly this qualification is growing in importance.

What about teachers already on staff? Should they be required to learn about and apply computer technology? A better approach may be to *inspire instead of require.*

Typically, a few teachers learn to use new instructional technology and become enthusiastic endorsers. Districts should build upon this spontaneous success by having those who have best adapted to the technology demonstrate their strategies to others. Visits to other school districts that have experienced success also may help.

Policymakers should heed research indicating that teachers have benefited the most from district computer training, in contrast to training they may receive from state agencies.[12] The key is to build incrementally, based on a longer range commitment that is district-wide. Simply to require training for all teachers, without specific goals in mind, will not produce real changes in applying technology to instruction.

Curriculum

Bearing directly on staff needs and concerns is the issue of how and where technology fits into curriculum. The growth of relatively sophisticated applications of computers and technology in education should prompt districts to reexamine their curriculum to make it compatible with technology they plan to acquire. Computers have the capacity to revolutionize both teaching and learning. The challenge is to combine traditional classroom approaches that have been proven effective with newer approaches relying more heavily on computers and technology.

Success depends partly on how much technology a district has and commitments to acquire more. Ideally, some might think, each student and each teacher should have unlimited access to a computer

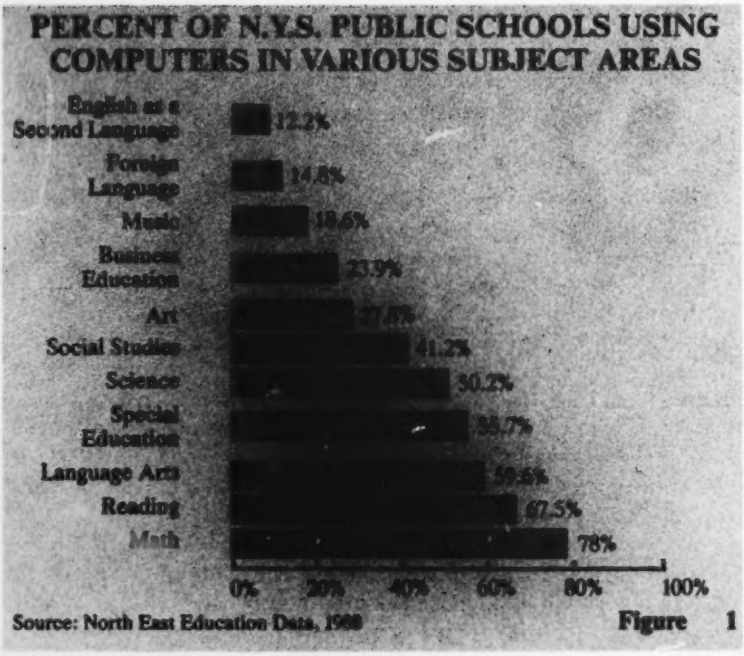

Figure 1

while in school. But access will not produce accountable learning or better teaching unless thorough planning has integrated computer usage into every aspect of curriculum. In districts that are hard pressed to purchase textbooks and hire competent, certified teachers, economically the idea is unrealistic.[13]

The Regents Action Plan does not specifically require districts to teach either about or with computers, though students in grades seven and eight must take one unit of technology education, which usually includes computer applications. The Regents recommend, instead, that computer learning occur across all disciplines.

For example, word processing frees English and language arts students from the mechanical writing process so they can concentrate on the creative aspect of composition. Social studies students run computer simulations of the 1929 stock market crash. Science students use the computer not only to tabulate the results of chemistry or physics experiments, but to simulate them as well. Drill and practice, the most common use of computers, is prevalent across a wide range of subject areas, from teaching multiplication tables in the elementary school grades to reinforcing concepts in music theory.

According to the North East Education Data survey, within New York State, mathematics courses make the most use of computers, closely followed by reading and language arts (see Figure 1). Notable and unfortunate, given today's employment demand, is that computer use in business education is relatively limited. Foreign language teach-

ers also make relatively little use of computers, though drill and practice are appropriate applications.

New York's profile, even though it does not distinguish among types of instructional use for computers, implies great imbalances in application across the academic disciplines. Software availability, curriculum design, and departmentalization all have a bearing.

Still, school boards should consider establishing goals, monitoring systems, and in-service budgetary commitments to redress the apparent imbalances.

Tied to this issue of which curricular areas use computers is determining where to place them. Should they all be in a computer laboratory, or resource center, or library and media center?

Seventy-four percent of the New York State public schools surveyed in the North East Education Data report had a computer lab in their buildings. The implications of restrictive placement of computers involve staff expertise, curriculum, and cost.

By having computers centrally located, a school sends the message to staff that only specialists should be in charge of computer instruction. Curriculum, moreover, in the lab would seem logically to be directed more to computer studies than to traditional subject areas. Finally, the cost of having a central lab in each school may be greater than decentralizing the units to individual classrooms in which access and adaptability of usage are greater. As many as 25 percent of this state's districts do this already. Districts have recognized the advantages of decentralizing.[14]

The Regents Action Plan for computer learning is distinctively different from the mandatory computer literacy courses found in many other states. There are advantages to implementing computer learning across all disciplines.

In the 1985-86 school year, the National Assessment of Educational Progress (NAEP) surveyed the nation's third, seventh, and 11th grade students for their knowledge and skill in using a computer. Among the major findings: computers seldom are used in subject areas such as reading, math, and science. Instead, computer classes were the norm. Concluded NAEP, "This compartmentalization restricts students from using the computer as a general-purpose learning tool that is useful across curriculum domains."[15]

On the other hand, a number of New York school districts thoughtfully have designed secondary level courses in computer studies, sometimes in innovatively specialized sequences. Responsive to the unique goals and needs of the local community, such courses should not be discouraged, but instead should be evaluated and compared with alternative strategies. Variances from Action Plan requirements to accommodate the separate courses should be allowed.

One potentially critical advantage of a separate course in computer literacy is the extent to which it promotes equal educational opportu-

nity. *All* students can be provided with basic knowledge about computers through a uniformly required course.

The overriding consideration in deciding whether to build computer learning into many courses—or just one—is a clear statement of instructional goals. The best choice may be a combination of integrated and discrete computer studies, but local school boards should set the preconditions for making that choice by adopting a foundation of instructional and curricular goals.

Equity

As already suggested, equal access to technology and computers is important. Equity issues include individual student access within a school building, access within the school district, the availability of equipment for both high wealth and low wealth districts, minority access, and male/female access.

NAEP's 1986 assessment of students' computer-related knowledge, skills, attitudes and experiences suggested males have greater access to computers than females, and slightly stronger competence in computer use than girls at all tested grade levels. Other research showed that more boys than girls enrolled in computer-based education programs. When girls enrolled, they were often prepared for low paying jobs such as word processing[16] while boys were given more opportunities to learn computer programming.

NAEP reported clear racial/ethnic differences in computer competence: white students fared better compared to black and Hispanic students at all grade levels. Other factors affecting competence included level of parents' education, home availability of computers, whether students attended public or nonpublic schools, their community of residence, and the region of the country.

Schools cannot fully compensate for the societal or economic biases that spawn inequities; however, they must be sensitive to circumstances that may preserve or intensify biases, and they must equalize opportunities over which they have control.

Sometimes the policies and practices of school districts inadvertently promote inequity in computer learning. According to a 1986 study by the American Institutes for Research of Palo Alto, California, analysis of more than 300 critical incidents in various schools across the country showed four major, *unintentional* causes of inequity: 1) irrelevant prerequisites—for example, not allowing students to use computers until they finished classroom assignments; 2) inappropriate placement of computers in school locations where usage may be disproportionately heavy or light; 3) overlooking staff members' reluctance to provide computer instruction or supervision; 4) accepting

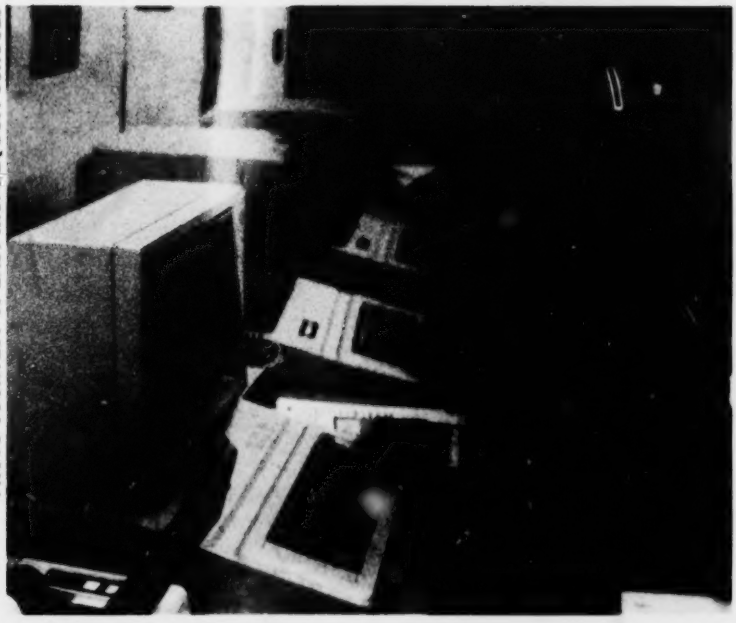

PHOTO COURTESY OF EAST IRONDEQUOIT SCHOOLS

proverbial assumptions about equitable computer learning —for example, assuming that certain student groups simply are not interested in joining computer clubs.[17]

Still another area to be aware of is the way students actually use the computers. Research indicates that schools with high minority populations often use computers for remedial activities, while predominantly white schools use computers for enrichment purposes.[18]

As school boards develop and assess their technology plans, they should seek ways to demonstrate commitment to equal student access and application of computers and technology.

Funding

Computers and related technologies are expensive. To school boards, they represent a major financial investment at a time when boards are increasingly being held accountable for how they spend their education dollars. Therefore, cost is one of the most important reasons school districts must carefully plan acquisition of this educational technology. What they purchase must not only be compatible with overall education goals and strategies, it also must be cost-effective.

One district discovered just how expensive poor or nonexistent computer planning could be. Because the district failed to make a detailed assessment of available equipment, it purchased hardware which was compatible with few software packages, and which did not perform well in the district's elementary schools. The district also purchased obsolete hardware with outdated business software. These two experiences convinced the district of the need to plan for future purchases.

In planning for acquisition, school districts should compare the effectiveness of the technology with other instructional methods. While existing research generally concludes that computers can substantially enhance learning, there is a question about their cost-effectiveness when compared with other learning methods.

Though there have been no studies making this specific comparison, research does indicate that among the available instructional technologies, the only ones presently viewed as cost-effective are mathematics drill and practice for elementary and middle school grades, and telecommunications/distance learning instruction.[19]

School districts use several ways to purchase state-aided hardware. The most common include competitive bidding, cooperative purchasing/leasing agreements with other districts through BOCES or a computer consortium, and the State Office of General Services electronic data processing contracts.[20] Districts should look for the best combination of these sources to ensure their dollars go the furthest.

When the New York State Legislature implemented state funding for computers, it split the aid onto two categories: hardware aid, which includes microcomputers, minicomputers, and terminals purchased and leased for instructional purposes; and software aid, designed for software packages to be used by districts as learning tools. Continued maintenance of the separate funding streams may reduce districts' flexibility to plan and implement local instructional computer priorities.

The two aids should be combined into one categorical formula to allow districts to make the best use of state support, whether for hardware, software, or even staff in-service training.

Conclusion

The importance of policy and planning on the part of school districts and their boards of education cannot be overly emphasized. Successful computer integration depends on laying the groundwork: a district should have definite goals which define what it expects technology to do in terms of instructional and/or administrative purposes.

Good planning addresses staff needs and concerns, the manner in which technology will be integrated into the curriculum, the manner and size of the district's financial commitment, and any other issues a district deems pertinent (see Appendix B).

A technology planning committee becomes a valuable advisory resource to the school board not only in terms of the initial planning process, but also in regularly monitoring and evaluating the plan in terms of the district goals it was designed to meet.

Computers alone cannot and will not improve the educational system; like any other tool, their success ultimately depends on the humans that operate them.

Appendix A

LAMPS Sample Policy 4510.1

Instructional Technology

The Board of Education recognizes its responsibility to ensure that district students have access to up-to-date technological materials and equipment. As used in this policy, "technology" refers principally to electronic materials and equipment, including computers, telecommunications, lasers and robotics.

The following reflect the district's goals for students regarding instructional technology:

1. to foster an atmosphere of enthusiasm and curiosity regarding new technology and its applications;
2. to heighten each student's familiarity and/or working knowledge of current technological materials/equipment;
3. to provide all students equal access to district technological materials/equipment and to instruction in their implementation;
4. to ensure that the various technologies are utilized in a variety of applications, and are not restricted to one subject area or one location in the schools; and
5. to promote district educational goals through the use of such technology(ies).

In order to achieve the above-stated goals, the Board shall create and appoint a computer/technology planning committee, which shall include representatives from groups utilizing technology in pursuit of district goals (i.e., Board members, administrators, teachers, support staff, parents, and students). The district's computer coordinator shall be the chairperson of the committee. Such committee shall advise the Board on the appropriate uses of technology for the district.

In addition, the Board directs the Superintendent of Schools to equip district schools with appropriate and up-to-date hardware/software, to schedule "hands-on" in-service activities for district staff, and to implement suggestions from the computer/technology planning committee and the instructional materials planning committee, within budgetary constraints.

Cross-Ref: 4000, Instructional Goals
4200, Curriculum Development
4526, Computer-Assisted Instruction

[This sample policy is excerpted from the Spring 1989 Update to *LAMPS (Law and Management Policies for Schools)*, a publication of the New York State School Boards Association.]

LAMPS Sample Policy 4526

Computer-Assisted Instruction

The Board of Education considers computers to be valuable tools for education, and encourages the use of computers and computer-related technology in district classrooms. The Board therefore directs the Superintendent to [designate; hire] a computer coordinator to oversee the use of district computer resources.

The computer coordinator will prepare in-service programs for the training and development of district staff in computer skills, and for the incorporation of computer use in appropriate subject areas. Applications may include instruction in computer programming and math skills; the use of word processing software in teaching reading/writing and other language skills; the use of drawing and composition programs in art, music and other fine arts classes; the charting of data in history/geography classes; the use of drill mastery programs in foreign language classes; and training in data management software in business education. The computer coordinator will encourage computer use as an integral part of the curriculum, and not merely as a minor instructional resource or reward for completed classwork.

The Superintendent, working in conjunction with the computer coordinator and the instructional materials planning committee, will be responsible for the purchase and distribution of computer software/hardware throughout district schools.

Cross-Ref: 4200, Curriculum Development
4510.1, Instructional Technology
9280, Professional Staff Development

[This sample policy is excerpted from the Spring 1989 Update to *LAMPS (Law and Management Policies for Schools)*, a publication of the New York State School Boards Association.]

Appendix B

"19 Tough Questions to Ask and Answer"*

Comparing the achievement test scores of students who use computers in class with those who don't is the last, not the first, step in evaluating the effectiveness of computer use. Here are 19 questions to ask (and answer) before you judge the impact of computers:

1. Is the use to which computers are put appropriate for the age and grade level of the students involved?
2. Are the lessons taught via computer software matched to stated curriculum goals?
3. Does the computer project have long-range value? Does it look ahead to the next five years?
4. Were all the "stakeholders" (teachers, principals, curriculum and staff development experts, parents, and students) involved in the planning process?
5. Do all of the stakeholders feel that their opinions were weighed before decisions were made?
6. Is there a workable plan for distributing computers to schools and for allocating student time at the computers?
7. Is there a systematic, overall plan for involving all teachers in computer training?
8. Does the training include how to manage instruction in the computer classroom as well as how to operate hardware and software?
9. Does the training build on previous successful training?
10. Is there a plan for additional training and assistance while computer use is going on?
11. Do teachers know what they want students to learn with the computer?
12. Do researchers know how to collect data on how often students use the computer?
13. Do researchers know how to judge the difference between what they hope will happen as the result of computer use as well as what actually happens?
14. Do teachers continue their normal interaction with students while the computers are being used?
15. Do teachers have access to the resources they need to use computers successfully?
16. Do teachers help students link their computer work with other classroom activities?
17. Do students have more than a superficial knowledge of what is happening as they work with computers?
18. Are students passive spectators or active participants during computer sessions?
19. Do you know which achievement test items are likely to be affected by computer-based work and which are likely to be unaffected?

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Notes

1. Office of Technology Assessment (U.S. Congress), "Power On! New Tools for Teaching and Learning" (Washington, D.C.: U.S. Government Printing Office, 1988), p. 4.
2. *State School Computer Aid Program,* (Albany, NY: Legislative Commission on Expenditure Review, 1988), p. 4.
3. Michael E. Martinez and Nancy A. Mead, *Computer Competence: The First National Assessment* (Princeton, NJ: Educational Testing Service, commissioned by the National Assessment of Educational Progress, 1988), pp. 29-37.
4. Peter H. Lewis, "The Computer Revolution Revised," *New York Times,* Educational Supplement (August 7, 1988).
5. *Webster's New Collegiate Dictionary,* 9th ed., s.v. "Technology."
6. *Computers in the Workplace: Selected Issues* (Washington, D.C.: National Commission for Employment Policy, 1986), p. 6.
7. David Moursund and Dick Ricketts, *Long-Range Planning for Computers in Schools* (Eugene, OR: Information Age Education, 1987), p. 5(6).
8. North East Education Data Report, unpublished survey, 1988.
9. *State School Computer Aid Program,* (Albany, NY: Legislative Commission on Expenditure Review, 1988), p. 5-4.
10. Peter West, "Digital Data: More Managers Tapping Computer Power," *Education Week,* November 7, 1988, pp. 1, 20-21.
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13. Peter H. Lewis, "The Computer Revolution Revised," *New York Times,* Educational Supplement (August 7, 1988).
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16. *Computers in the Workplace: Selected Issues* (Washington, D.C.: National Commission for Employment Policy, 1986), p. 60.
17. Phyllis DuBois and Jane G. Schubert, "Do Your School Policies Provide Equal Access to Computers? Are You Sure?" *Educational Leadership,* March 1986, pp. 41-44.
18. Karl S. Wittman, "Computer Equity," speech presented at the program, The Electronic Classroom, May 15, 1984.
19. *Time for Results: The Governor's 1991 Report on Education,* Supporting Works: Task Force on Technology (Washington, D.C.: National Governors' Association Center for Policy Research and Analysis, 1986), p. 20.
20. *State School Computer Aid Program,* (Albany, NY: Legislative Commission on Expenditure Review, 1988), p. 8.

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